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L. Debb

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

Refai, Wail

Serial No. 09/048,686

Filed: March 26, 1998

For: **BROADBAND COMMUNICATION  
SYSTEM USING POINT AND SHOOT  
APPROACH**

Attorney's Docket No. 4015-108

S. Rao  
Examiner  
Group Art Unit 2661

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Appeal Brief

**(1) REAL PARTY IN INTEREST**

The real party in interest is Ericsson Inc., the Assignee of the present application.

**(2) RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences to the best of Applicant's  
knowledge.

**(3) STATUS OF CLAIMS**

Claims 1, 3-8, 10, and 12-21 are pending in the application.

Claims 1, 3-8, 10, 12-18, and 21 are allowed.

Two (2) claims have been finally rejected by the Examiner. They are claims 19 and 20. Applicant appeals from both rejected claims.

#### **(4) STATUS OF AMENDMENTS**

Amendments submitted after the Final Office Action have not been entered. The claims in Appendix A represent the state of the claims as of the Final Office Action.

#### **(5) SUMMARY OF INVENTION**

Modern satellite communication networks are increasingly called upon to deliver a variety of multimedia services, such as data, images, and video, as well as traditional voice content. The bandwidth requirements of such services necessitate the use of very high-speed transmission rates in the forward link, from the satellite to receivers. However, the sophistication and cost of receiver technology that can realistically be deployed effectively limits the transmission rates to levels insufficient to deliver the rich, multimedia content. To address this limitation, Applicant invented a communication system, and associated receivers, specifically designed to reduce the cost, complexity, and battery power consumption of the receivers. A brief overview of the communication system (as recited in the allowed claims of the present application) is necessary to place the inventive receiver, that is the subject of this appeal, in context.

Applicant's communication system employs a "point and shoot" approach, in which a large plurality of data packets is combined into a broadband signal that is broadcast, via a satellite relay station, to all receivers simultaneously. Each receiver

monitors the data stream and extracts only data packets addressed to that receiver. Prior art "point and shoot" networks could accommodate only low data rates, as each receiver must demodulate and decode the entire data stream in order to inspect the receiver address of each data packet. In effect, each receiver must receive, demodulate, decode – and discard – every other receiver's data, retaining only the data packets addressed to it. In Applicant's communication system, the satellite relay station constructs and broadcasts a narrow band "index signal" in addition to the broadband data signal. This index signal contains only receiver addresses and the start times of associated data packets; it does not include the data itself. The index signal thus exhibits a much lower bit rate than the data signal. A receiver designed for this communication system may continuously monitor the narrow band index signal rather than the broadband data signal – a much more computationally tractable task. Upon detecting its address in the index signal, the receiver may utilize the associated start time to receive and extract only its own data packets from the broadband data signal.

Claims 19 and 20 recite such a receiver. The receiver contains two separate receiving paths: a first path for "demodulating and decoding a received narrow band index signal to extract addressing information," and a second path for "demodulating and decoding a received broadband primary data signal." Additionally, claim 19 recites that the second (broadband) path is "selectively activated" based on addressing information in the index signal – which is received and decoded by the first (narrow band) path. Dependent claim 20 further recites the use of a buffer memory in the second path to temporarily store the received broadband primary data signal. This allows for some tolerance in the precise timing of selectively activating the second

receiver path when the receiver's address is detected in the first path. Figure 4 depicts the receiver in block diagram form.

In this manner, the need for an expensive, complex receiver capable of real-time demodulation and inspection of the entire broadband data stream is avoided. In other words, receiver cost is managed by confining the task of continuous, real-time monitoring to a low-bandwidth index channel.

## **(6) ISSUES**

Whether claim 19 is anticipated under 35 U.S.C. § 102(b) by U.S. Patent No. 4,829,372 to McCalley, *et al.* ("McCalley")?

Whether claim 20 is obvious under 35 U.S.C. § 103(a) in light of McCalley and the Examiner's official notice that use of an input buffer is well known in the communication arts?

## **(7) GROUPING OF CLAIMS**

Claims 19 and 20 should be grouped together. Both of the claims stand or fall together.

## **(8) ARGUMENT**

### **A. The Law of Anticipation**

Anticipation under 35 U.S.C. § 102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention. *Rockwell Intern. Corp. v. U.S.*, 147 F.3d 1358, 47 U.S.P.Q.2d 1027 (Fed. Cir. 1998). That is, every element and

limitation of the claim must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990).

While it is true that the PTO may give a claim its broadest reasonable meaning when determining patentability, *Burlington Industries, Inc., v. Quigg*, 822 F.2d 1581 (Fed. Cir. 1987), the Examiner cannot ignore the "reasonableness" limitation. In differentiating between reasonable and unreasonable interpretations, the basic rules of claim interpretation apply. First, terms in a claim must be given their plain and ordinary meaning unless the applicant has clearly provided a contrary definition in the specification. *In re Zletz*, 893 F.2d 319 (Fed. Cir. 1989). *See also*, MPEP § 2111.01.

Second, terms and phrases of a claim must be construed in harmony with the Applicant's written description. "[The mandate of broadest reasonable interpretation during prosecution] does not relieve the PTO of its essential task of examining the entire patent disclosure to discern the meaning of claim words and phrases." *Atlantic Thermoplastics Co., Inc. v. Faytex Corp.*, 970 F.2d 834 (Fed. Cir. 1992), *reh'g in banc denied*, 974 F.2d 1279 (Fed. Cir. 1992). *See also*, MPEP § 2111.

Third, the interpretation given to claim terms and phrases must be consistent with the interpretation that would be given by one skilled in the art. *In re Cortright*, 165 F.3d 1353 (Fed. Cir. 1999). "It is axiomatic that, in proceedings before the PTO, . . . claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Bond*, 910 F.2d 831 (Fed. Cir. 1990). *See also*, MPEP § 2111.01.

Finally, what the applicant states the claims to mean is vital to an examination of patentability. "When the applicant states the meaning that the claim terms are intended

to have, the claims are examined with that meaning, in order to achieve a complete exploration of the applicant's invention and its relation to the prior art." *In re Zletz*, 893 F.2d 319 (Fed. Cir. 1989). "The inquiry during examination is patentability of the invention as 'the applicant regards' it . . ." *Id.*

**B. McCalley does not anticipate the receiver of claim 19.**

McCalley discloses a presentation player for extracting certain video and audio signals distributed in a CATV system, and directing them to a particular subscriber:

The function of presentation player converter 66 is to locate and tune to that frequency band within the CATV spectrum where the digital information stream is located, and to transform and monitor this information for processing and handling details as required to deliver video/audio presentations to requesting subscribers.

McCalley, col. 8, lines 57-63. Note that McCalley first locates and tunes to the channel where the content resides, and then transforms and monitors the data stream. In particular, and with reference to Fig. 3, the McCalley presentation player includes a fixed control channel receiver 68 (and associated demodulator 70), a frequency agile broadband receiver 74 (and associated demodulator 78), and a receiver controller 72. The Examiner stated that these functional blocks anticipate the narrow band index signal receiver path (first signal processing means), the broadband primary data signal receiver path (second signal processing means), and control means of claim 19, respectively. Final Office Action of 07 May 2002, p. 2, ¶ 1.

The fixed control channel receiver 68 is permanently tuned to a specific narrow-band control channel, which transmits digitally encoded control information to the presentation player. Among the control information is the frequency of a designated, high-speed input channel within the CATV spectrum on which the relevant content is

transmitted. The fixed control channel receiver 68 forwards the digital control information to the receiver controller 72. col. 8, line 66 – col. 9, line 13.

The receiver controller 72 receives the control information and acts on it. Among other tasks, it commands the frequency agile broadband receiver 74 to tune to a particular channel. col. 9. lines 13-20. The broadband receiver 74 tunes to the designated channel, and the associated demodulator 76 converts the analog signal into a digital bit stream, performs error correction, and forwards the data packets to receiver controller 72. col. 9. lines 20-26. The receiver controller 72 receives the data stream, and selects the packets to be forwarded to other system components for distribution to the proper subscriber. col. 9. lines 20-26.

In McCalley, the selection of data packets for a particular subscriber, based on data packet address information, is performed after the entire data stream on the designated channel is demodulated and decoded. That is, the McCalley presentation player operates on the prior art “point and shoot” principle – that the entire broadband data stream must be received, demodulated, and decoded, and then selection of the relevant data packets may be performed, passing those on to the user and discarding the rest. This is the very scheme that, prior to Applicant's invention, limited the transmission bit rate in “point and shoot” satellite communication systems, as each receiver must operate continuously and at a very high speed to decode the entire broadband data stream (or, in the case of McCalley, the entire data stream on one of a plurality of channels to which the receiver is directed). In other words, the broadband receiver of McCalley is not “selectively activated” as clearly recited in claim 19.

An inventive feature of the present invention is that the high-speed, broadband data stream is only selectively demodulated and decoded when (*i.e.*, after) a receiver's address is detected. By having the address and start time information of the primary data packets removed to a narrow band index signal, the receiver of the present invention avoids the need to continuously demodulate, decode, and inspect each and every data packet in the broadband data signal, as McCalley does. Rather, the broadband receiver path of the present invention may "sleep" until a packet addressed to the receiver is detected in the narrow band index signal, and only at that point be "selectively activated . . . based on addressing information in said index signal", to extract and decode from the broadband data the actual packet addressed to it.

The broadband receiver 74 of McCalley is not "selectively activated" by the receiver controller 72 – rather, it is selectively tuned by the controller. "In essence, the presentation player converter 66 [the functional block containing the three modules discussed above – see Fig. 2] is a frequency-agile broadband receiver with a high-speed data receiver tuned by a narrow-band fixed frequency control channel." col. 8, lines 30-34. Nothing in McCalley discloses or even suggests that the broadband receiver 74 is "selectively activated."

The Examiner stated, "The specific frequency selectively activates the [McCalley] broadband receiver to tune to a specific frequency. This anticipates the selective activating." Final Office Action of 07 May 2002, p. 4, ¶ 4 (as continued from p. 3). The selective tuning of a frequency-agile receiver cannot reasonably be equated with selective activation of a fixed-frequency receiver. First, such an interpretation is contrary to the plain meaning of the claim language. "Tune" refers to frequency



selection; “activate” refers to placing in an active or operative state. For example, one “selectively tunes” a television with the channel up/down buttons; one “selectively activates” it with the on/off button.

Second, claim terms must be interpreted in light of the specification. Applicant’s specification makes it clear that “selective activation” of the broadband primary data receiver path refers to its operative dormancy prior to a relevant address being detected.

The index signals are transmitted over a narrow band beam and the information signals are transmitted over a broadband beam from the satellite to a plurality of receivers. Each receiver continuously demodulates and decodes the narrow band index signal. The index signals are transmitted over a narrow band beam with the same bit rate as the information signals. The ground-based receivers continuously demodulate and decode the narrow band beam. The receiver, using address information contained in the index signal, locates and extracts data in the information signal intended for that receiver. When an address appears in the index signal that matches the receiver’s address, the target receiver enables an onboard buffer to record or store a relevant portion of the information signal. By buffering the relevant portion of the information signal, the receiver is not required to demodulate and decode the high-speed information signal of all other receivers, but instead may perform the demodulation and decoding of only its own information from the knowledge obtained from the index signal. This means that each designated receiver expecting an information signal will only demodulate its own information signal from the stream of packets. As high-speed demodulation and decoding of data signals is technically challenging and not particularly cost effective, the benefit of such a dual signal broadcast and buffering receiver configuration can be seen in the reduced technical complexity of the mass produced receiver units and consequently their lower design and production costs.

Specification, p. 4, second paragraph (emphasis added).

Third, claim terms must be interpreted consistent with the interpretation one of ordinary skill in the art would afford them. The McGraw-Hill Dictionary of Scientific and Technical Terms (5<sup>th</sup> ed.) defines “tune” as “to adjust for resonance at a desired frequency.” This definition leaves no room for equating the term with “activate.” Similarly, the same reference defines “activate” in several ways, the most relevant of

which is “to set up conditions so that the object will function as designed or required.” None of the definitions for “activate” include any reference to changing the frequency of reception. The unambiguously separate and non-overlapping definition of these terms in a standard scientific and technical reference is highly probative that one of ordinary skill the art would not equate them.

Finally, Applicant’s statement of the intended meaning of claim terms cannot be ignored. Applicant has described the structure and operation of the receiver of claim 19 repeatedly in the record in prosecution of this application, and not one such statement equates “selectively activating” with “selectively tuning.” *See, e.g.*, Response of 30 Jan 2002, p. 3 (emphasis in original):

Of these [two receiver paths], only the index signal receiver path is continuously operative, scanning the index data stream for its address. Only when a matching address is detected in the index data stream is the second receiver path – the broadband primary data receiver – activated to extract those data packets addressed to the receiver.

*See also*, Response of 14 June 2002, p. 4 (emphasis in original):

[T]he fixed control channel receiver of McCalley receives digitally encoded control information, including the frequency of a designated, high-speed input channel within the CATV spectrum. The broadband receiver of McCalley then tunes to this channel, and selectively extracts data packets to send to the presentation player. col. 9, lines 18-22. In contrast, the second (broadband) input stream of claim 19 does not selectively tune to any channel – it receives the entire broadband data signal.

The proposition that the continuously operative, selectively tuned broadband receiver McCalley anticipates Applicant’s “selectively activated” fixed-frequency broadband receiver is untenable. Such an interpretation violates the plain meaning of the terms; it is completely irreconcilable with Applicant’s specification; it does not comport with the interpretation that one of ordinary skill in the art would ascribe to it;

and it is contrary to Applicant's clear statements in the record as to the intended meaning of the claim language.

Furthermore, a clear understanding of the structure and operation McCalley's presentation player precludes such an interpretation. McCalley's receiver controller 72 inspects data packet headers in the demodulated and decoded broadband data stream to selectively forward the data packets to addressed subscribers – the frequency agile broadband receiver 74 is necessarily continuously operative (and occasionally commanded to a different frequency), to provide the data packets whose headers are monitored. It cannot logically be selectively activated based on address data, as it is the entity that provides the data packets containing subscriber addresses! Hence, McCalley fails to anticipate Applicant's receiver as recited in claim 19 under 35 U.S.C. § 102(b).

**C. McCalley, in combination with the Examiner's official notice, does not render the receiver of claim 20 obvious.**

As discussed above, McCalley does not disclose or suggest a receiver wherein a broadband receiver path is selectively activated in response to addresses detected in a continuously operative narrow band receiver path. The Examiner's official notice of the use of input buffers in the communication arts does not cure this defect. Consequently, the Examiner has failed to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

**Conclusion**

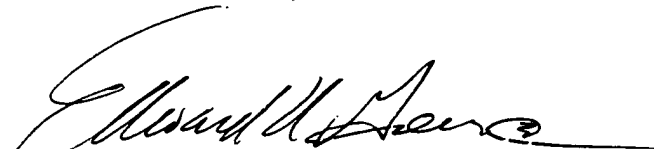
For the reasons set forth above, all claims being appealed herein are patentably novel and nonobvious over the cited art, and the rejections maintained by the Examiner must be reversed.

Enclosed is a check for \$320.00 to cover the fee for this Appeal Brief.

Respectfully submitted,

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## **(9) APPENDIX A**

### **Claims**

19. A receiver for a broadband communication system comprising:
- a first signal processing means for demodulating and decoding a received narrow band index signal to extract addressing information contained in said index signal;
  - a second signal processing means for demodulating and decoding a received broadband primary data signal; and
  - control means for selectively activating said second signal processing means based on addressing information in said index signal.
- 20 The communication system of claim 19 wherein said receiver further includes an input buffer temporarily storing said received primary data signal before demodulating and decoding portions of said primary data signal.



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# **McGraw-Hill Dictionary of Scientific and Technical Terms**

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Editor in Chief

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## TUBULIDENTATA



Skull and jaw of *Orycteropus gaudryi*, a Pliocene tubulidentate from Samos, Greece.

**tubule** [ANAT] A slender, elongated microscopic tube in an anatomical structure. { 'tū,byūl }

**Tubulidentata** [VERT ZOO] An order of mammals which contains a single living genus, the armadillo (*Orycteropus*) of Africa. { ,tū-byə-lə-den-tā-də }

**tubulin** [BIOCHEM] A globular protein containing two subunits; 10-14 molecules are arranged to form a microtubule. { 'tū-byə-lən }

**tubuloalveolar gland** See tubuloalveolar gland. { 'tū-byə-lə-as-ə-nəs ,gland }

**tubuloalveolar gland** [ANAT] A secreting structure having both tubular and alveolar secretory endpieces. Also known as acinotubular gland; tubuloalveolar gland. { 'tū-byə-lə-al-vē-ə-lər ,gland }

**Tucana** [ASTRON] A constellation in the southern hemisphere; right ascension 23 hours, declination 60° south. Also known as Toucan. { tū'kā-nə }

**tuck-and-pat pointing** See tuck pointing. { 'tək ən 'pat ,pōint-ɪŋ }

**tuck joint pointing** See tuck pointing. { 'tək ,jōint ,pōint-ɪŋ }

**tuck pointing** [BUILD] The finishing of old masonry joints in which the joints are first cleaned out and then filled with fine mortar which projects slightly or has a fillet of putty or lime. Also known as tuck-and-pat pointing; tuck joint pointing. { 'tək ,pōint-ɪŋ }

**tufa** [GEOL] A spongy, porous limestone formed by precipitation from evaporating spring and river waters, often onto leaves and stems of neighboring plants. Also known as calcareous sinter; calcareous tufa. { 'tū-fə }

**tuffaceous** [GEOL] Pertaining to or similar to tufa. { tū'fā-shəs }

**tuff** [GEOL] Consolidated volcanic ash, composed largely of fragments (less than 4 millimeters) produced directly by volcanic eruption; much of the fragmented material represents finely comminuted crystals and rocks. { tʌf }

**tuffaceous** [GEOL] Pertaining to sediments which contain up to 50% tuff. { tʌ'fā-shəs }

**tuff ball** See mud ball. { 'tʌf ,bɔl }

**tuff lava** See welded tuff. { 'tʌf ,lāv-ə }

**tuft** See mound. { tʌft }

**tuft method** [FL MECH] A technique of surface flow visualization in which an array of short pieces of flexible string or yarn are attached to a surface in such a way that they can move freely under the influence of a flow. { 'tʌft ,set }

**tugboat** [NAV ARCH] A powerful, strongly built boat with shaped hull and bow, designed to tow or push other vessels or barges in harbors, on inland waterways, and at sea. { 'tʌg ,bɔt }

**tugger** [MIN ENG] A small portable pneumatic or electric hoist mounted on a column and used in a mine. { 'tʌg-ər }

**Tukey lemma** [MATH] The proposition that any nonempty family of finite character has a maximal member. { 'tū-kē ,lem-ə }

**Tukon tester** [ENG] A device that uses a diamond (Knoop) indenter applying average loads of 1 to 2000 grams to determine microhardness of a metal. { 'tū,kən ,tes-tər }

**tularemia** [VET MED] A bacterial infection of wild rodents caused by *Pasteurella tularensis*; it may be generalized, or it may be localized in the eyes, skin, or lymph nodes, or in the respiratory tract or gastrointestinal tract; may be transmitted to humans and to some domesticated animals. { ,tū-lə're-mē-ə }

**tulip** [BOT] Any of various plants with showy flowers constituting the genus *Tulipa* in the family Liliaceae; characterized by coated bulbs, lanceolate leaves, and a single flower with six equal perianth segments and six stamens. { 'tū-ləp }

**tulip poplar** See tulip tree. { 'tū-ləp ,pāp-lər }

**tulip tree** [BOT] *Liriodendron tulipifera*. A tree belonging to the magnolia family (Magnoliaceae) distinguished by leaves which are squarish at the tip, true terminal buds, cone-shaped fruit, and large greenish-yellow and orange-colored flowers. Also known as tulip poplar. { 'tū-ləp ,trē }

**tulle** See malines. { tʊl }

**Tully-Fisher relation** [ASTRON] A relation between the rotational velocity of a galaxy, as reflected in the width of the 21-centimeter line, and the intrinsic luminosity of the galaxy. { 'tʌl-ē 'fɪsh-ər nɪ,lā-shən }

**tumble** See topple. { 'təm-bəl }

**tumble axis** See topple axis. { 'təm-bəl ,ak-səs }

**tumble home** [ARCH] An inclination inward from the greatest breadth of a structure. Also known as tumble in. [NAV ARCH]

The curve of a boat or ship's upper side toward the centerline, causing the sides to be convex. { 'təm-bəl 'hōm }

**tumble in** See tumble home. { 'təm-bəl 'ɪn }

**tumble-plating process** [MET] A method of zinc-coating small metal parts by first applying zinc powder with an adhesive, then tumbling with glass beads to roll out the powder into a continuous coat. { 'təm-bəl 'plād-ɪŋ ,prə-səs }

**tumbler** [ENG] 1. A device in a lock cylinder that must be moved to a particular position, as by a key, before the bolt can be thrown. 2. A device or mechanism in which objects are tumbled. { 'təm-blər }

**tumbler feeder** See drum feeder. { 'təm-blər ,fēd-ər }

**tumbler gears** [MECH ENG] Idler gears interposed between spindle and stud gears in a lathe gear train; used to reverse rotation of lead screw or feed rod. { 'təm-blər ,gɪz }

**tumbleweed** [BOT] Any of various plants that break loose from their roots in autumn and are driven by the wind in rolling masses over the ground. { 'təm-bəl ,wēd }

**tumbling** [AERO ENG] An attitude situation in which the vehicle continues on its flight, but turns end over end about its center of mass. [ENG] A surface-finishing operation for small articles in which irregularities are removed or surfaces are polished by tumbling them together in a barrel, along with wooden pegs, sawdust, and polishing compounds. [MECH ENG] Loss of control in a two-frame free gyroscope, occurring when both frames of reference become coplanar. { 'təm-blɪŋ }

**tumbling mill** [MECH ENG] A grinding and pulverizing machine consisting of a shell or drum rotating on a horizontal axis. { 'təm-blɪŋ ,mɪl }

**tumid** [BIOL] Marked by swelling or inflation. { 'tū-məd }

**tumor** [MED] Any abnormal mass of cells resulting from excessive cellular multiplication. { 'tū-mər }

**tumorigenic** [MED] Tumor-forming. { 'tū-mə-rə'jen-ɪk }

**tumor necrosis factor** [IMMUNOL] A monokine that induces leukocytosis, fever, weight loss, the acute-phase reaction, and necrosis of some tumors. { 'tū-mər nə'krō-səs ,fak-tər }

**tumull lava** [GEOL] A type of lava flow forming ovoid mounds, a few feet high and a few tens of feet long, caused by buckling up of the crust. { 'tū-myə,lɪ 'lā-və }

**tuna** [VERT ZOO] Any of the large, pelagic, cosmopolitan marine fishes which form the family Thunnidae including species that rank among the most valuable of food and game fish. { 'tū-nə }

**tunable echo box** [ELECTROMAG] Echo box consisting of an adjustable cavity operating in a single mode; if calibrated, the setting of the plunger at resonance will indicate the wavelength. { 'tū-nə-bəl 'ek-ə ,bɔks }

**tunable filter** [ELECTR] An electric filter in which the frequency of the passband or rejection band can be varied by adjusting its components. { 'tū-nə-bəl 'fɪl-tər }

**tunable laser** [OPTICS] A laser in which the frequency of the output radiation can be tuned over part or all of the ultraviolet, visible, and infrared regions of the spectrum. { 'tū-nə-bəl 'lā-zər }

**tuna** [VERT ZOO] Any of the large, pelagic, cosmopolitan marine fishes which form the family Thunnidae including species that rank among the most valuable of food and game fish. { 'tū-nə }

**tunable magnetron** [ELECTR] Magnetron which can be tuned mechanically or electronically by varying its capacitance or inductance. { 'tū-nə-bəl 'magnə'trən }

**tuna boat** See tuna clipper. { 'tū-nə ,bɔt }

**tuna clipper** [NAV ARCH] A large craft used for tuna fishing on the Pacific coast; it is usually diesel-powered, and is equipped with refrigeration brine tanks. Also known as tuna boat. { 'tū-nə 'klɪp-ər }

**tundish** [MET] A funnel or pouring basin used for transferring a stream of molten metal. { 'tən,dɪʃ }

**tundra** [ECOL] An area supporting some vegetation between the northern upper limit of trees and the lower limit of perennial snow on mountains, and on the fringes of the Antarctic continent and its neighboring islands. Also known as cold desert. { 'tən-drə }

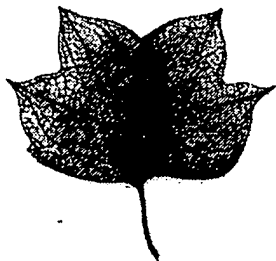
**tundra climate** [CLIMATOL] The climate which produces tundra vegetation; it is too cold for the growth of trees but does not have a permanent snow-ice cover. { 'tən-drə ,klɪ'mət }

**tune** [ELECTR] To adjust for resonance at a desired frequency. { tʊn }

**tuned amplifier** [ELECTR] An amplifier in which the load is a tuned circuit; load impedance and amplifier gain then vary with frequency. { 'tʊnd 'am-plə,fɪ-ər }

**tuned-anode oscillator** [ELECTR] A vacuum-tube oscillator whose frequency is determined by a tank circuit in the anode

## TULIP TREE



Twig, terminal bud, and leaf of the tulip tree (*Liriodendron tulipifera*).

## TUNA



Bluefin tuna (*Thunnus thynnus*).

with chemical reactions produced by light or other radiation. [ ,ak-tə-nō'kəm-rə-sū ]

**actinochitin** [BIOCHEM] A form of birefringent or anisotropic chitin found in the seta of certain mites. [ ,ak-tə-nō'kī-tən ]

**Actinochitinosi** [INV ZOO] A group name for two closely related suborders of mites, the Trombidiformes and the Sarcop-  
tiformes. [ ,ak-tə-nō'kī-tə-nō'sē ]

**actinodielectric** [ELEC] Of a substance, exhibiting an in-  
crease in electrical conductivity when electromagnetic radiation  
is incident upon it. [ ,ak-tə-nō'dī-ə'lek-trik ]

**actinoelectricity** [ELEC] The electromotive force produced  
in a substance by electromagnetic radiation incident upon it.  
[ ,ak-tə-nō'ī,lek'trīs-ə-dē ]

**actinogram** [ENG] The record of heat from a source, such as  
the sun, as detected by a recording actinometer. [ ,ak'tin-  
ə,gram ]

**actinograph** [ENG] A recording actinometer. [ ,ak'tin-  
ə,graf ]

**actinoid elements** See actinide series. [ 'ak-tə,nōid 'el-ə-  
mans ]

**Actinolaimoidea** [INV ZOO] A superfamily of nematodes in  
the order Dorylaimida, containing some species with remarkable  
elaborations of the stoma and the characteristic axial spear.  
[ 'ak-tə-nō'ī-ə'mōid-ē-ə ]

**actinolite** [MINERAL]  $\text{Ca}_2(\text{Mg},\text{Fe})_3\text{Si}_8\text{O}_{22}(\text{OH})_2$  A green,  
monoclinic rock-forming amphibole; a variety of asbestos oc-  
curring in needlelike crystals and in fibrous or columnar forms;  
specific gravity 3-3.2. [ ,ak'tin-ə,līt ]

**actinology** [PHYS] The branch of physics dealing with elec-  
tromagnetic radiation and its chemical effects. [ ,ak-tə'nāl-ə-  
jē ]

**actinomere** [INV ZOO] One of the segments composing the  
body of a radially symmetrical animal. [ ,ak'tin-ə,mir ]

**actinometer** [ENG] Any instrument used to measure the in-  
tensity of radiant energy, particularly that of the sun. [ ,ak-  
tə'nām-əd-ər ]

**actinometry** [ASTROPHYS] The science of measurement of  
radiant energy, particularly that of the sun, in its thermal, chem-  
ical, and luminous aspects. [ ,ak-tə'nām-ə-trē ]

**actinomorphic** [BIOL] Descriptive of an organism, organ, or  
part that is radially symmetrical. [ ,ak-tə-nō'mōr-fik ]

**Actinomyces** [MICROBIO] The type genus of the family Ac-  
tinomycetaceae; anaerobic to facultatively anaerobic; includes  
human and animal pathogens. [ ,ak-tə-nō'mī-sēs ]

**Actinomycetaceae** [MICROBIO] A family of bacteria in the  
order Actinomycetales; gram-positive, diphtheroid cells which  
form filaments but not mycelia; chemoorganotrophs that fer-  
ment carbohydrates. [ ,ak-tə-nō,mī-sə'tās-ē-ē ]

**Actinomycetales** [MICROBIO] An order of bacteria; cells form  
branching filaments which develop into mycelia in some fami-  
lies. [ ,ak-tə-nō,mī-sə'tā-lēz ]

**actinomycete** [MICROBIO] Any member of the bacterial fami-  
ly Actinomycetaceae. [ ,ak-tə-nō'mī,sēt ]

**actinomycin** [MICROBIO] The collective name for a large  
number of red chromoprotein antibiotics elaborated by various  
strains of *Streptomyces*. [ ,ak-tə-nō'mī-sən ]

**actinomycosis** [MED] An infectious bacterial disease caused  
by *Actinomyces bovis* in cattle, hogs, and occasionally in hu-  
mans. Also known as lumpy jaw. [ ,ak-tə-nō,mī'kō-səs ]

**actinomyosin** [BIOCHEM] A protein complex formed by the  
combination of actin and myosin during muscle contraction.  
[ ,ak-tə-nō'mī-sə-sən ]

**Actinomyxida** [INV ZOO] An order of protozoan invertebrate  
parasites of the class Myxosporidea characterized by trivalved  
spores with three polar capsules. [ ,ak-tə-nō'mik-sə-də ]

**actinon** [NUC PHYS] A radioactive isotope of radon, symbol  
An, atomic number 86, atomic weight 219, belonging to the  
actinium series. Also known as actinium emanation (Ac-Em).  
[ ,ak-tə,nən ]

**actinophage** [MICROBIO] A bacteriophage that infects and  
lyses members of the order Actinomycetales. [ ,ak'tin-ə,fāj ]

**Actinophryida** [INV ZOO] An order of protozoans in the sub-  
class Heliozoa; individuals lack an organized test, a centroplast,  
and a capsule. [ ,ak-tə-nō'frī-ə-də ]

**Actinoplanaceae** [MICROBIO] A family of bacteria in the  
order Actinomycetales with well-developed mycelia and spores  
formed on sporangia. [ ,ak-tə-nō-plā'nās-ē-ē ]

**Actinoplanes** [MICROBIO] A genus of bacteria in the family  
Actinoplanaceae having aerial mycelia and spherical to sub-

spherical sporangia; spores are spherical and motile by means  
of a tuft of polar flagella. [ ,ak-tə-nō'plā-nēz ]

**Actinopodea** [INV ZOO] A class of protozoans belonging to  
the superclass Sarcodina; most are free-floating, with highly  
specialized pseudopodia. [ ,ak-tə-nō'pōd-ē-ə ]

**Actinopteri** [VERT ZOO] An equivalent name for the  
Actinopterygii. [ ,ak-tə'nāp-tə,ri ]

**Actinopterygii** [VERT ZOO] The ray-fish fishes, a subclass of  
the Osteichthyes distinguished by the structure of the paired  
fins, which are supported by dermal rays. [ ,ak-tə'nāp-tə'rij-  
ē,ī ]

**actinostele** [BOT] A protostele characterized by xylem that  
is either star-shaped in cross section or has ribs radiating from  
the center. [ ,ak'tin-ə,stēl ]

**actinostome** [BIOL] 1. The mouth of a radiate animal. 2.  
The peristome of an echinoderm. [ ,ak'tin-ə,sōm ]

**Actinostromalidae** [PALEON] A sphaeractinoid family of  
extinct marine hydrozoans. [ ,ak-tə-nō'strō-mə'ri-ə,dē ]

**actinotherapy** See radiation therapy. [ ,ak-tə-nō'ther-ə-pē ]

**actinotrocha** [INV ZOO] The free-swimming larva of *Pho-  
ronis*, a genus of small, marine, tubicolous worms. [ ,ak-tə-  
nō'trō-kə ]

**actinouranium** [NUC PHYS] A naturally occurring radioactive  
isotope of the actinium series, emitting only alpha decay; symbol  
AcU; atomic number 92; mass number 235; half-life  $7.1 \times 10^8$   
years; isotopic symbol  $^{235}\text{U}$ . [ ,ak-tə-nō,yū'rā-nē-əm ]

**actinula** [INV ZOO] A larval stage of some hydrozoans that  
has tentacles and a mouth; attaches and develops into a hydroid  
in some species, or metamorphoses into a medusa. [ ,ak'tin-yə-  
lə ]

**action** [MECH] An integral associated with the trajectory of a  
system in configuration space, equal to the sum of the integrals  
of the generalized momenta of the system over their canonically  
conjugate coordinates. Also known as phase integral. [ORD]  
The mechanism of a gun, usually breechloading, by which it is  
loaded, fired, and unloaded. [ ,ak'shən ]

**action at a distance theory** [PHYS] A theory of the interac-  
tion of two bodies separated in space, without concern for a  
detailed mechanism of the propagation of effects between bod-  
ies. [ ,ak'shən at ə'distəns,thē-ə-rē ]

**action current** [PHYSIO] The electric current accompanying  
membrane depolarization and repolarization in an excitable cell.  
[ ,ak'shən,kə-rənt ]

**action entries** [COMPUT SCI] The lower right-hand portion of  
a decision table, indicating which of the various possible actions  
result from each of the various possible conditions. [ ,ak'shən  
'en-trēz ]

**action integral** See action variable. [ ,ak'shən 'int-ə-grəl ]

**action period** [ELECTR] The period of time during which data  
in a Williams tube storage device can be read or new data can  
be written into this storage. [ ,ak'shən,pir-əd ]

**action portion** [COMPUT SCI] The lower portion of a decision  
table, comprising the action stub and action entries. [ ,ak'shən  
'pōrshən ]

**action potential** [PHYSIO] A transient change in electric po-  
tential at the surface of a nerve or muscle cell occurring at the  
moment of excitation. [ ,ak'shən pə'ten-shəl ]

**action-reaction law** [PHYS] The law that when one body  
exerts force on another, the second body exerts a collinear force  
on the first equal in magnitude but oppositely directed. [ ,ak-  
shən're,ak'shən,lō ]

**action spectrum** [PHYSIO] Graphic representation of the  
comparative effects of different wavelengths of light on living  
systems or their components. [ ,ak'shən,spēk-trəm ]

**action stub** [COMPUT SCI] The lower left-hand portion of a  
decision table, consisting of a single column listing the various  
possible actions (transformations to be done on data and mat-  
erials). [ ,ak'shən,'stəb ]

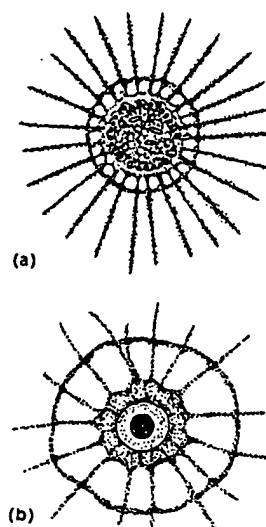
**action variable** [PHYS] The integral  $\int p dq$  over a cycle of a  
dynamical system;  $q$  is some coordinate, and  $p$  the conjugate  
momentum. Also known as action integral. [ ,ak'shən,'ver-  
ē-ə-bəl ]

**actium** [ECOL] A rocky seashore community. [ ,ak-tē-əm ]

**activate** [ELEC] To make a cell or battery operative by addi-  
tion of a liquid. [ELECTR] To treat the filament, cathode, or  
target of a vacuum tube to increase electron emission. [ENG]

To set up conditions so that the object will function as designed  
or required. [NUCLEO] To induce radioactivity through bom-  
bardment by neutrons or by other types of radiation. [ORD] 1.

## ACTINOPHRYIDA



Examples of Actinophryida.  
(a) Single specimen of  
*Actinosphaerium eichorni* (after  
Bernard). (b) Single specimen of  
*Actinophrys pontica*. (From R. P.  
Hall, *Protozoology*, Prentice-Hall,  
1953)



- To bring into existence by official order a unit, post, camp, station, base, or shore activity which has previously been constituted and designated by name or number, or both, so that it can be organized to function in its assigned capacity. 2. To prepare for active service a naval ship or craft which has been in an inactive or reserve status. [PHYS] To start activity or motion in a device or material. { 'ak-tə,vāt }
- activated alumina** [MATER] Highly porous, granular aluminum oxide that preferentially absorbs liquids from gases and vapors, and moisture from some liquids; also used as a catalyst or catalyst carrier, as an absorbent to remove fluorides from drinking water, and in chromatography. { 'ak-tə,vād-əd ə'lūm-ənə }
- activated bauxite** See filter bauxite. { 'ak-tə,vād-əd 'bók-sīt }
- activated carbon** [MATER] A powdered, granular, or pelleted form of amorphous carbon characterized by very large surface area per unit volume because of an enormous number of fine pores. Also known as activated charcoal. { 'ak-tə,vād-əd 'kär-bən }
- activated cathode** [ELECTR] A thermionic cathode consisting of a tungsten filament to which thorium has been added, and then brought to the surface, by a process such as heating in the absence of an electric field in order to increase thermionic emission. { 'ak-tə,vād-əd 'kath,əd }
- activated charcoal** See activated carbon. { 'ak-tə,vād-əd 'char,köl }
- activated clay** [MATER] Bentonite, or other clay, treated with acid to enhance its ability to absorb or bleach. { 'ak-tə,vād-əd klā }
- activated coal plough** [MIN ENG] A type of power-operated cutting blade used for coal seams too hard to be sheared by a normal blade. { 'ak-tə,vād-əd 'köl ,plau }
- activated complex** [PHYS CHEM] An energetically excited state which is intermediate between reactants and products in a chemical reaction. Also known as transition state. { 'ak-tə,vād-əd 'käm-pleks }
- activated diffusion** [SOLID STATE] Movement of atoms, ions, or lattice defects across a potential barrier in a solid. { 'ak-tə,vād-əd di'fyū-zhən }
- activated macrophage** [IMMUNOL] A macrophage whose ability to destroy microbes or other cells has been enhanced because of stimulation by a lymphokine. { 'ak-tə,vād-əd 'mak-rə,fāj }
- activated rosin flux** [MATER] Soldering flux containing activating agents which promote wetting by the solder. { 'ak-tə,vād-əd 'räz-ən 'fləks }
- activated sintering** [MET] Sintering of a metal powder compact in contact with a gaseous atmosphere which reacts with the metal surfaces and enhances the joining of metal particles. { 'ak-tə,vād-əd 'sін-tər-īŋ }
- activated sludge** [CIV ENG] A semiliquid mass removed from the liquid flow of sewage and subjected to aeration and aerobic microbial action; the end product is dark to golden brown, partially decomposed, granular, and flocculent, and has an earthy odor when fresh. { 'ak-tə,vād-əd 'sləj }
- activated-sludge effluent** [CIV ENG] The liquid from the activated-sludge treatment that is further processed by chlorination or by oxidation. { 'ak-tə,vād-əd ,sləj 'ef,lū-ənt }
- activated-sludge process** [CIV ENG] A sewage treatment process in which the sludge in the secondary stage is put into aeration tanks to facilitate aerobic decomposition by microorganisms; the sludge and supernatant liquor are separated in a settling tank; the supernatant liquor or effluent is further treated by chlorination or oxidation. { 'ak-tə,vād-əd ,sləj 'prā,səs }
- activating enzyme** [BIOCHEM] An enzyme that catalyzes a reaction involving adenosinetriphosphate and a specific amino acid to give a product that subsequently reacts with a specific transfer ribonucleic acid. { 'ak-tə,vād-īŋ 'en,zīm }
- activating reagent** [MATER] Material added to another material or mixture so that a physical or chemical change will take place more rapidly or completely. { 'ak-tə,vād-īŋ ,rē'ā-jənt }
- activating receptor** [PHYSIO] A sense organ at the end of a nerve that triggers a specific response when it is stimulated. { 'ak-tə,vād-īŋ rə'septər }
- activation** [CHEM] Treatment of a substance by heat, radiation, or activating reagent to produce a more complete or rapid chemical or physical change. [ELEC] The process of adding liquid to a manufactured cell or battery to make it operative. [ELECTR] The process of treating the cathode or target of an electron tube to increase its emission. Also known as activation. [MET] 1. A process of facilitating the segregation of ore powders by the use of substances which change the response of the particle surfaces to a flotation process that increases the rate of pressing and heat powder into cohesion. [MOL BIO] A change that is an amino acid before it is utilized for protein synthesis. [NUCLEO] The process of inducing radioactivity by bombardment with neutrons or with other types of radiation. The designation for all changes in the ovum during fertilization from sperm contact to the dissolution of nuclear membrane. { 'ak-tə'vā-shən }
- activation analysis** [NUCLEO] A method of chemical analysis based on the detection of characteristic radionuclides following a nuclear bombardment. Also known as radioanalysis. { 'ak-tə'vā-shən ə'nal-əs-səs }
- activation cross section** [NUC PHYS] The cross section for the formation of a radionuclide by a particular interaction. { 'ak-tə'vā-shən 'krəs ,sek-shən }
- activation energy** [PHYS CHEM] The energy, in excess of the ground state, which must be added to an atomic or molecular system to allow a particular process to take place. { 'ak-tə'vā-shən 'en-ərjē }
- activation record** [COMPUT SCI] A variable part of a program module, such as data and control information, that may be used with different instances of execution. { 'ak-tə'vā-shən 'ərd }
- activator** [CHEM] 1. A substance that increases the effectiveness of a rubber vulcanization accelerator; for example, zinc oxide or litharge. 2. A trace quantity of a substance that imparts luminescence to crystals; for example, silver or copper in sulfide or cadmium sulfide pigments. [GEN] A molecule that modifies a repressor in a way that enables it to stimulate operon transcription. [GRAPHICS] See accelerator. { 'ak-tə,vād-əd 'aktivər }
- activator ribonucleic acid** [GEN] Ribonucleic acid molecules which form a sequence-specific complex with receptor genes linked to producer genes. { 'ak-tə,vād-əd ,rībō'nū,klē-əs-əd }
- active accommodation** [CONT SYS] The alteration of programmed robotic motions by the integrated effects of sensor controllers, and the robotic motion itself. { 'ak-tiv ə,käm-ə'dā-shən }
- active anaphylaxis** [IMMUNOL] The allergic response following reintroduction of an antigen into a hypersensitive individual. { 'ak-tiv 'an-ə-fə'lak-səs }
- active antiroll system** [NAV ARCH] A system of antiroll tanks in a ship in which pumps are used to transfer the liquid, through a connecting channel, from one tank in a pair to the other. { 'ak-tiv ,an-tē'rōl 'sīs-təm }
- active area** [ELECTR] The area of a metallic rectifier that acts as the rectifying junction and conducts current in the forward direction. { 'ak-tiv 'er-ē-ə }
- active balance** [COMMUN] Summation of all return currents, in telephone repeater operation, at a terminal network balanced against the impedance of the local circuit or drop. { 'ak-tiv 'bal-əns }
- active center** [ASTRON] A localized, transient region of the solar atmosphere in which sunspots, faculae, plages, prominences, solar flares, and so forth are observed. [BIOCHEM] 1. A flexible portion of an enzyme that binds to the substrate and converts it into the reaction product. 2. In carrier and receptor proteins, the portion of the molecule that interacts with the specific target compounds. [CHEM] 1. Any one of the points on the surface of a catalyst at which the chemical reaction is initiated or takes place. 2. See active site. { 'ak-tiv 'sen-tər }
- active chaff** [ORD] An expendable battery-powered jammer, usually supported by parachute or balloon, dropped by aircraft to saturate enemy radars or produce delayed false returns when triggered by enemy radars. { 'ak-tiv 'chaf }
- active communications satellite** [AERO ENG] Satellite which receives, regenerates, and retransmits signals between stations. { 'ak-tiv kə,mjū-nə'kā-shənz 'sād-ə,līt }
- active component** [ELEC] In the phasor representation of quantities in an alternating-current circuit, the component of current, voltage, or apparent power which contributes power, namely, the active current, active voltage, or active power. Also known as power component. [ELECTR] See active element. { 'ak-tiv kəm'pō-nənt }
- active computer** [COMPUT SCI] When two or more computers